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NEW PRODUCT INTRODUCTION BY USING HOSHIN KANRI

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Abstract
Hoshin Kanri builds on the Lean philosophy. Hoshin Kanri provides standardized tools for step-by-step entity wide strategic planning, an inherited continuous improvement process and the control of success. Hoshin planning is that part of an organizationÕs strategic planning system which identifies, develops, deploys, audits, and modifies a specific plan to focus the organizationÕs efforts on the breakthroughs of developments required achieving the strategic vision of the organization. In the article as aim to decision about introduces a new product family in one diesel engine factory the X-Matrix is defined. X-Matrix attends to convert strategy to reality by using both horizontal and vertical alignment in the organization.

Keywords:
Hoshin Kanri, Lean Management, PDCA circle

1 INTRODUCTION

Hoshin Kanri are Japanese words, because Hoshin Kanri was developed in Japan. Understanding the meaning of the words Hoshin Kanri helps understand its concept. The literal translation of "ho" is "direction", "shin" is "needle", "kan" is "control" and "ri" is "logic". So Hoshin Kanri, or just Hoshin, stands for "setting up direction" or more likely "policy deployment".

Hoshin Kanri is a concept that helps organization to gain more competitive advantage by deploying the same policy (direction) on all organizational levels or departments. At first glance, policy deployment looks very similar to Management by Objectives [1]. Actually, Hoshin is a mash-up of P.Drucker's Management by Objectives (MBO) and W.A.Shewhart's Plan-Do-Check-Act cycle (PDCA, Shewhart or Deming cycle).

Hence, Hoshin Kanri is a concept consisting of tools, forms and rules that provide structure for organizational planning process. It helps achieve breakthrough results through long-term objectives and ensure continual improvement through short-term objectives.

Hoshin PDCA cycle is a bit different than the standard PDCA cycle, because it has to link all levels of organization: top, middle and operational level (Figure 1).

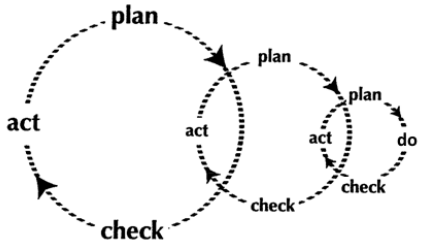

Figure 1: Hoshin Kanri PDCA cycle

1.1 Basic elements of Hoshin Kanri

There are five basic elements of a complete Hoshin Kanri plan (P. Babich in [2]):

1. The Business Fundamentals Plan documents daily work. It is based on organization's mission.
2. The Long Range Plan documents how the organization expects to operate in the future. It is based on organization's vision.
3. The Annual Plan documents the key objectives that must be accomplished this year in order for the organization to move along the path toward achieving its long range plan and vision.
4. Review Tables compare actual results to expected results and document changes to the plan.
5. Abnormality Tables document "out of the ordinary" occurrences and facilitate problem root cause removal.

Crucial element of Hoshin Kanri is Hoshin team which is responsible for three of seven Hoshin experiments. The three experiments carried out by Hoshin team are:

- Long-term strategy, a general plan for next 5 to 100 years;
- Midterm strategy, a plan for next 3 to 5 years;
- Annual Hoshin strategy, a concrete plan of actions for next 6 to 18 months.

Other Hoshin experiments are: tactics ï carried out by tactical teams, operations ï carried out by operational teams, Kaikaku and Kaizen ï carried out by action teams.

Basic Hoshin documents are a set of documents that can be printed on paper of European A3 size, so each document has "A3" in its name. The Hoshin documents are:

- A3-i or Intelligence report reports conditions of demand and supply;
- A3-T or Team charter conducts strategic, tactical or operational Hoshin experiment.
- A3-X or X-Matrix bundles several A3-Ts together and explores their interdependencies;
- A3-P or Problem report propose to charter a team to solve an immediate problem;
- A3-SR or Status report reports PDCA investigation linked to specific A3-Ts and A3-Ps;
- A3-SSR or Summary status report reports of progress on A3-Ts bundled in an A3-X.

In this paper the X-Matrix is chosen to support business process reengineering to introduce a new product in one production enterprise.

1.2 X-Matrix

Document called X-Matrix or A3-X represents recorded results of the process of strategy design. X-Matrix is used for midterm and annual strategies. The process of strategy design identifies the factors critical to success. Identified factors are mutually compared to identify their correlation. The correlation between critical factors can have different strength:

- "weak" correlation, represented by "1" or △
- "not very strong" correlation, represented by "2" or ○
- "strong" correlation, represented by "3" or ⊙

The X-Matrix consists of four quadrants representing: strategies, tactics, process and results. Additionally, a quadrant representing team members can be used. Quadrants are connected with fields which are filled up with correlation identified before.

The annual Hoshin strategy is focused on 6 to 18 months. To setup an annual strategy it is necessary to follow these steps (T. L. Jackson in [3]):

6. Pre-step: Record breakthrough objectives. This is a pre-step because it is usually done when forming a midterm strategy. It is important to identify the most important breakthrough objectives or major opportunities which are represented as strategies in "strategies" quadrant of X-Matrix.
7. Identify opportunities and develop tactics for the next 6 to 18 months. To establish opportunities the Hoshin documents A3-T are used, especially the ones that didn't qualify as midterm strategies. To establish tactics the A3-T for project plan is used.
8. Prioritize and analyze opportunities. The three to five opportunities with highest priority are selected and recorded to the "tactics" quadrant of X-Matrix.
9. Establish contribution targets for results. It is needed to determine how much company's revenues or profit must grow and how much company's costs must shrink. The improvement targets are recorded on the "results" quadrant of X-Matrix.
10. Establish targets for process improvement. It is important to identify "which", "how" and "how much" improve process to achieve desired results. The identified processes are recorded on the "process" quadrant of X-Matrix.
11. Study interdependencies between strategies, tactics, process and results and determine correlation. It is important to analyze and identify the strength of correlation between strategies and tactics, tactics and process, process and results, results and strategies. All correlations are recorder on the X-Matrix.
12. Assign teams for each tactic and provide accountability. The person responsible for each tactic is determined. The person's titles are recorder on the "team member" quadrant of X-Matrix.

After the annual strategy setup is completed, for each tactic in X-Matrix (A3-X) the A3-T document should exist.

2 THE ENGINE FACTORY REORGANIZATION

The engine factory production program consists of: production of the main (propulsion) engines, auxiliary engines and providing cooperation services.

The main (propulsion) engine is company's core product and it is mainly intended for local shipyards. The auxiliary engine is used to produce electricity on board. Cooperation services include the services of casting and machining for the shipyards and other enterprises. Annual production consists of: 6 main (propulsion) engines and 15 auxiliary engines.

2.1 New product introduction

The impossibility of competition on the world market and the possible loss of domestic markets (downfall of the Croatian shipbuilding industry) force the engine factory to search for the new markets and to increase production out of shipbuilding industry. Hence, expanding engines sales on the world market is not possible due to licensing restrictions, and due to extremely strong Korean and Chinese competitors.

So the engine factory management decided to introduce a new product: complete steel structure for the wind turbines (Figure 2).

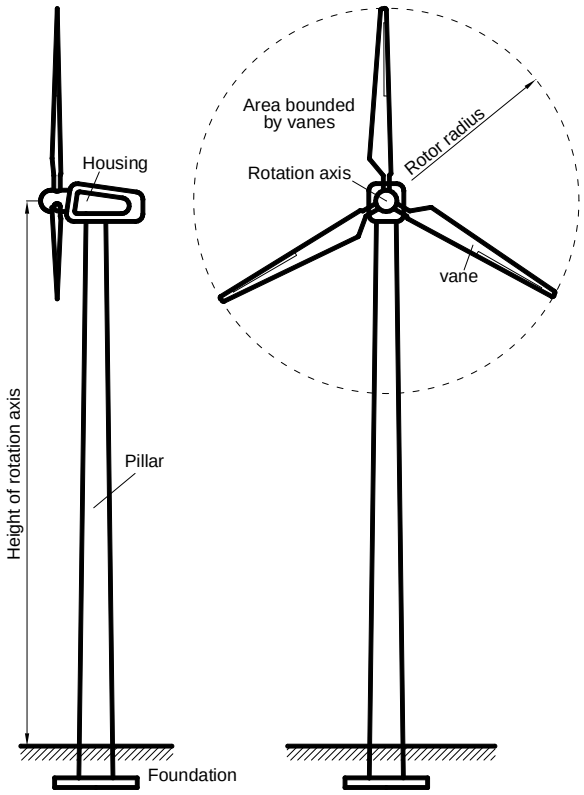

Figure 2: Wind turbine

2.2 The engine factory reorganization using X-Matrix

The aim of the factory reorganization is to determine whether the introduction of a new product (complete steel structure for the wind turbines) and reengineering of current production (reduction of production of main and auxiliary engines and increasing the share of services) will help company to survive enormous changes on the market.

The analyses were made using detailed Hoshin Kanri PDCA cycle (Figure 3) and X-Matrix. When all the data and objectives were gathered and analyzed the X-Matrix was made (Figure 4).

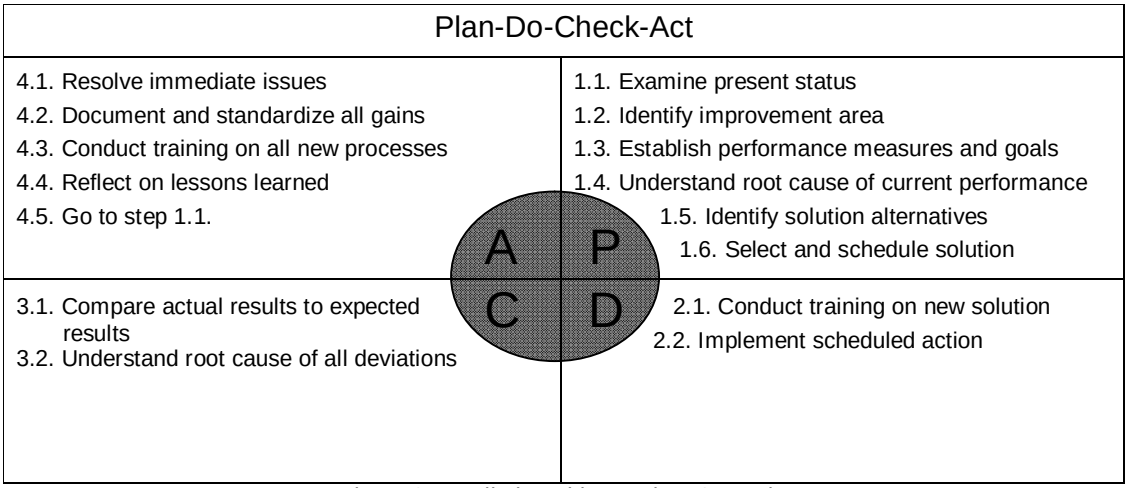

Figure 3: Detailed Hoshin Kanri PDCA cycle

A3-X

X-MATRIX — **THEME: The engine factory reorganization**

Correlation								Correlation / contribution								Accountability					
⊙	△	⊙	⊙	△	○	○	Whole factory integration	△	○	○	○	△	○	○	⊙	△	○	○	○	⊙	○
⊙	○	⊙	⊙	△	○	○	PCDA cycle implementation	○	⊙	⊙	○	○	⊙	⊙	○	○	⊙	○	○	○	⊙

Gain data about factory current state	Increase percent of ñservices" in total factory business activities	Prolong factory business activities introducing new product	Development of new factory organization structure adapted to new product introduction	Factory certification for ISO 14001	Perform tool inventory check and improve tool management	"Set in orderñwarehouse		Reduce price of raw material for 10%	Utilization of currently allocated raw material in warehouse	Reduce percentage of remained raw material from shipped products for 50%	Costï effective tool usage	Reduction of tool costs for 25 %	Reduction of casting scrap for 10%	Outsourcing increase for 60%	Kaizen event every month	Team members: "Services" marketing team	New product introduction team	IT services for new product team	Certification team	Warehousing team	New product production team
							TACTICS														
							STRATEGIES **X** **PROCESS**														
							RESULTS														
⊙	○	⊙	⊙	○	△	△	Revenue: 19.2 mil. ú	⊙	○	○	△	△	⊙	○	○						
△	○	⊙	○	⊙	⊙	△	Material costs: 8.28 mil. ú	⊙	⊙	⊙	○	⊙	○	△	△						
Correlation								Correlation / contribution													

Figure 4: X-Matrix for the engine factory reorganization

Each process defined in the X-Matrix was analyzed in details:

a) Reduce price of raw material for 10% by contacting several manufacturers, creating competition and achieving long-term business deals.

b) Utilization of currently allocated raw material in warehouse by avoiding unnecessary warehouse use.

c) Reduce percentage of remained raw material from shipped products for 50% by controlling requisitions for raw material, using specialized software to determine the current situation in the warehouse and properly diminish the quantity on the requisition.

d) Costï effective tool usage by preventing a purchasing of tools more than necessary (it is not necessary that each employee has his own tools, but the tool has to be shared).

e) Reduction of tool costs for 25 % by fixing old and damaged tool.

f) Reduction of casting scrap for 10% by controlling alloy between certain phases and by adequate preparation of die.

g) Outsourcing increase for 60% by using every outsourcing possibility as much as possible especially for accounting services.

h) Kaizen event every month by meeting and talking about company's new possibilities to improve.

After filling the quadrants of strategies, tactics, process and results, and determining the persons who will be responsible for the implementation of goals, it is necessary to determine the strength of correlation.

The strength of correlation is determined between:

- results and strategies
- strategies and tactics
- tactics and processes
- processes and results

"Services" marketing team, consists of two members, the head of sales and head of cooperation who arranges the sale of services.

In new product introduction team, members are director of production, which is also the team leader, a technologist and a representative for quality.

IT services for new product team for new product consists of two members, representatives of IT and construction, procurement and production.

In the certification team members are assistant director of quality and technical manager.

In Warehousing team is head of the warehouse and informatics technician.

New product production team consists of the director of production, head of design, machining workshop managers and chief technologists.

The old production program (Table 1) had bigger revenue (21,5 mil. ú) than a new one (19,2 mil. ú), but it was unsustainable due to mentioned reasons.

Table 1: Old production program of the engine factory

Production program	Products per year	Revenue by product	Revenue
Main engine	6	3.0 mil. ú	18.0 mil. ú
Auxiliary engine	15	0.2 mil. ú	3.0 mil. ú
Cooperation services			0.5 mil. ú
TOTAL			**21.5 mil. €**

The revenue of the new production program was estimated by forecasting sales of main and auxiliary engines and forecasting of service providing. Additionally, the forecasting of sales of a new product was made using market analysis, so the table representing new production program of engine factory was made (Table 2).

Although it is showed that by changing the production program and defining the exact strategies, tactics and process this company can survive in new conditions, it is necessary to reduce the number of employees from 300 to 260. 40 workers are the surplus as long as new products and markets are not found.

Table 2: New production program of the engine factory

Production program	Products per year	Revenue by product	Revenue
Main engine	4	3.0 mil. ú	12.0 mil. ú
Auxiliary engine	12	0.2 mil. ú	2.4 mil. ú
Cooperation services			0.8 mil. ú
Wind turbines	**10**	**0.4 mil. €**	**4.0 mil. €**
TOTAL			**19.2 mil. €**

By rationalization and restructuring certain improvements are achieved, but it is certainly not possible to keep those 40 workers that are surplus. Hence, this rationalization is a important step to become a SME (Small and Medium-sized Enterprise) instead of being LE (Large Enterprise), but the same policy deployment remains [4].

3 CONCLUSION

Every company wants to be recognized on the market by quality of its products and every company wants achieve long-term sustainability. Hoshin Kanri is exactly the philosophy that allows company to realize this. It is a business philosophy that encourages the analysis of the situation, making improvements, checking performance and taking appropriate measures. So, to conclude [5]: "Hoshin is not a system. Hoshin is a purpose. The purpose is to ensure that everybody is pulling together in the same direction."

Additionally, X-Matrix provides a unique visualization of design strategies on a single piece of paper. It is showing very clearly (through the quadrants of the strategies, tactics and process) what objectives company needs to achieve in the current period (6-18 months) and the long-term period (next 2-4 years). It also tells how to get there and who is responsible for it. And at the end the quadrant of results shows the impact of investments in business processes.

All the advantages of X-Matrix are presented on the engine factory reorganization case study. Using X-Matrix on a single piece of paper, it is simply and clearly said what this company needs to do to survive enormous changes that recently occurred on the market.

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